INSTRUCTION MANUAL

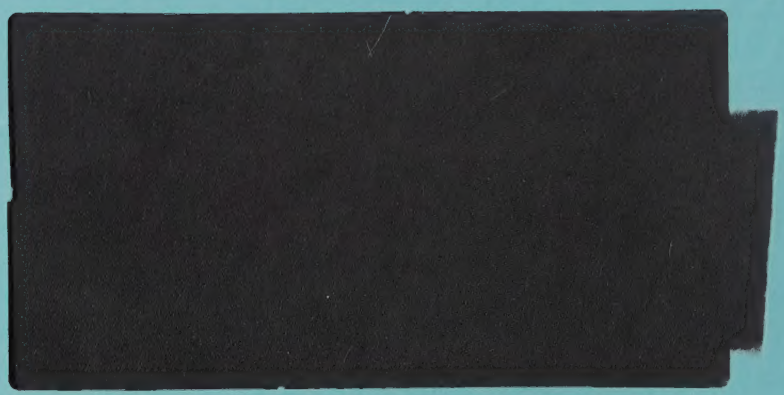
REGULATED POWER SUPPLIES

MODELS

LQS-DA-5000 SERIES

LAMBDA

LAMBDA ELECTRONICS CORP.-MELVILLE, L. I., N. Y.



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REGULATED POWER SUPPLIES

MODELS

LQS-DA-5000 SERIES

This manual provides instructions intended for the operation of Lambda power supplies, and is not to be reproduced without the written consent of Lambda Electronics Corp. All information contained herein applies to all LQS-DA-5000 models unless otherwise specified.

LAMBDA ELECTRONICS CORP. MELVILLE, L.I., N.Y.
MAIN PLANT TELEPHONE: 516 MYrtle 4-4200

IM-LQS-DA-5

TABLE OF CONTENTS

Section	Page
SPECIFICATIONS AND FEAUTRES	1
THEORY OF OPERATION	2
OPERATING INSTRUCTIONS	3
Basic Mode of Operation	3
Connections for Operations	3
Supply Load Connections	4
Operation After Protective Device Shutdown	4
MAINTENANCE	4
General	4
Trouble Analysis	4
Checking Capacitors	4
Trouble Chart	5
Performance Checks	6
SERVICE	6
PARTS ORDERING	7

SPECIFICATIONS AND FEATURES

DC OUTPUT - Voltage regulated for line and load. See table I for voltage and current ratings.

TABLE I
VOLTAGE AND CURRENT RANGES

MODELS	OUTPUT VOLTAGE (VOLTS)	MAXIMUM CURRENT (AMPS) AT 40°C AMBIENT
LQS-DA-5106	6	25
LQS-DA-5124	24	5
LQS-DA-5324	24	10
LQS-DA-5128	28	5
LQS-DA-5328	28	10
LQS-DA-5148	48	2.5
LQS-DA-5348	48	5

REGULATED VOLTAGE OUTPUT

Regulation, line.....2% for line changes from 105-132 VAC for any load between 25% and 100% of full load.
Regulation, load.....5% from 1/2 load to full load (LQS-DA-5106 is 0.5V).
Ripple and Noise.....2% RMS (LQS-DA-5106 is 500mV).
Frequency coefficient..2.4%/cycle max.
Accuracy.....$\pm$ 2% @ 25°C, 115 VAC, 60Hz input and 100% load.

AC INPUT - 105-132 VAC at 59-61 Hz. Input power*: 230 Watts for LQS-DA-5106, 5124, 5128, and 5148; 350 Watts for LQS-DA-5324, 5328, and 5348. Input current*: 2.6 Amps for LQS-DA-5106, 5124, 5128, and 5148; 3.5 Amps for LQS-DA-5324, 5328, and 5348. *With output loaded to full current rating and input voltage 105 volts AC, 60 Hz.

OVERLOAD PROTECTION

Thermal.....Thermostat resets automatically when over-temperature condition is eliminated. (Thermostat is integral part of transformer on models LQS-DA-5124, 5128, 5328.) Models LQS-DA-5106, 5148, 5324, 5348 are inherently protected against thermal overload by transformer inductance.

OVERLOAD PROTECTION (Con't)

Electrical.....Automatic current limiting limits output current to a safe value. Automatic current limiting protects the load and power supply when external overloads and direct shorts occur.

INPUT AND OUTPUT CONNECTIONS - Terminal block on front of chassis.

OPERATING AMBIENT TEMPERATURE RANGE AND DUTY CYCLE - Continuous duty from 0°C to 40°C ambient. Consult factory for operations to 60°C.

STORAGE TEMPERATURE (non-operating) - -55°C to 85°C

PHYSICAL DATA

Size.....5" x 7-1/2" x 10"

Weight.....LQS-DA-5324, 28, 48: 30 lbs. net; 33 lbs. shipping.
LQS-DA-5106, 24, 28, 48: 15 lbs. net; 18 lbs. shipping.

Finish.....Gray, FED. STD. 595 No. 26081.

MOUNTING - One surface, with tapped mounting holes, can be utilized for mounting this unit. Do not mount with Right Side facing up. Refer to figure 6 for mounting details.

ACCESSORIES

Rack Adapters.....Rack adapters LRA-6, LRA-7, LRA-10, LRA-11, and LRA-13 used for ruggedized mounting with or without chassis slides are available.

THEORY OF OPERATION

The Lambda power supply consists of an AC input circuit and regulating transformer; resonating capacitors; main rectifier and filter.

Single phase input power is applied to transformer T1 through the AC terminals.

The resonating capacitors form a resonant circuit with the resonant winding of T1 at 60Hz.

This resonance causes saturation of the core on each alternate half cycle when AC input is applied. This saturation causes a clipping effect on the transformer output waveform. The result is a close approximation of a square wave at the transformer output.

The transformer output is rectified by the main rectifier, a full wave rectifier, and filtered by the main filter capacitors. The result is a low ripple output which is constant for all specified conditions of line and load.

OPERATING INSTRUCTIONS

BASIC MODE OF OPERATION

This power supply operates as a constant voltage source provided the load current does not exceed the rated value at 40°C. For continuous operation, load current must not exceed the rating. When rated load current is exceeded, voltage decreases until voltage reaches zero and the current at short circuit is held to a safe value.

CONNECTIONS FOR OPERATION

NOTE: Make all connections to the unit before applying AC input power.

Ground Connections. The Lambda power supply can be operated either with negative or positive output terminal grounded. Both positive and negative ground connections are shown in the diagram for the suggested output connection illustrated in this manual.

Connection Terminals. Make all connections to the supply at the terminal block on the rear of the supply. Apply input power to the AC terminals.

The supply positive terminal is brought out to two +V terminals. The supply negative terminal is brought out to two -V terminals. Recommended wiring of the power supply to the load and selection of wiring is shown in figures 1 through 3. Selection of proper wiring is made on the basis of load requirements. Make all performance checks and measurements of current or voltage at the rear output terminals. Connect measuring devices directly to terminals or use the shortest leads possible.

SUPPLY LOAD CONNECTIONS

Connections for Operation as a Constant Voltage Source

Recommended supply-load connection is described in the following paragraphs.

Refer to figure 1 to determine voltage drop for particular cable length, wire size and current conditions. Lead lengths must be measured from supply terminals to load terminals as shown in figure 2.

Refer to figure 3 for supply load connection.

OPERATION AFTER PROTECTIVE DEVICE SHUTDOWN

Thermal Shutdown (Models LQS-DA-5124, 5128, and 5328 only.)

The thermostat (integral part of T1) opens the input circuit only when the temperature of the transformer exceeds a maximum safe value. The thermostat will automatically reset when the temperature of the transformer decreases to a safe operating value. After eliminating the cause(s) for overheating and allowing time for the power supply to cool to a proper temperature, resume operation of the supply.

MAINTAINANCE

GENERAL

This section describes trouble analysis routine and replacement procedures that are useful for servicing the Lambda LQS-DA-5000 series power supply. A trouble chart is provided as an aid for the troubleshooter. Refer to the section on SPECIFICATIONS AND FEATURES for the minimum performance standards.

TROUBLE ANALYSIS

Whenever trouble occurs, systematically check primary power lines, external circuit elements, and external wiring for malfunction before trouble shooting the equipment. Failures and malfunctions often can be traced to simple causes such as improper jumper and supply-load connections.

Use the electrical schematic diagram and block diagram, figure 4, as an aid to locating trouble causes. The schematic diagram contains various circuit voltages that are typical for normal operation. Measure these voltages using the conditions for measurement specified on the schematic diagram. Use measuring probes carefully to avoid causing short circuits and damaging circuit components.

CHECKING CAPACITORS

Disconnect one side of capacitor before performing resistance check. The leakage resistance obtained from a simple resistance check of a capacitor is not always an indication of a faulty capacitor. Only a dead short is a true indication of a shorted capacitor.

TROUBLE CHART

The trouble chart is intended as a guide for locating trouble causes and is used along with the schematic diagram.

The operating conditions assumed for the trouble chart are as follows:

a) AC power of proper voltage and frequency is present at input terminals.

b) Either positive or negative terminal is connected to chassis ground.

c) The power supply is connected for constant voltage.

SAFETY NOTICE

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT. OBSERVE THE USUAL SAFETY PRECAUTIONS WHEN OPERATING OR SERVICING THE EQUIPMENT TO AVOID SHOCK OR INJURY.

TROUBLE SHOOTING CHART

	Symptom	Probable Cause	Remedy
1.	Zero volts DC output.	Short circuit across output of supply.	Check load and load connections, correct as necessary.
		T1 primary open.	Check T1, replace as necessary.
		C3, C4 shorted.	Check C3, C4 for short; replace as necessary.
		Open thermostat, S1. (Models LQS-DA-5124, 5128, 5328 only.)	Refer to table I of SPECIFICATIONS AND FEATURES for current ratings at given ambient temperature. After allowing time for for the power supply to cool, resume operation of power supply.
2.	High ripple at line frequency or twice line frequency.	Open T1, secondary.	Check T1, replace as necessary.
		C3, C4 open.	Check C3, C4 for open; replace as required.
		CR1, CR2 open.	Check CR1, CR2; replace as necessary.

TROUBLE SHOOTING CHART (Con't)

	Symptom	Probable Cause	Remedy
3.	Very low output voltage.	CR1 or CR2 open.	Check CR1, CR2; replace as necessary.
		C1 shorted or open	Check C1, replace as necessary.
4.	Input current excessive.	Shorted T1 primary.	Check T1, replace as necessary.

PERFORMANCE CHECKS

Check the ripple and regulation of the power supply using the test connection diagram shown in figure 5. Use suggested test equipment or equivalent to obtain accurate results. Refer to SPECIFICATIONS AND FEATURES for minimum performance standards.

NOTE: D.C. output must be read with a meter capable of reading true D.C. level.

Set the differential meter, DC DVM (John Fluke Model 801H or equivalent) to the selected power supply operating voltage. Check the power supply load regulation accuracy while switching from the load to half-load condition. Long load leads should be a twisted pair to minimize AC pick-up.

Use a Variac to vary the line voltage from 105-132 or 132-105 volts AC and check the power supply line regulation accuracy on the DVM differential meter.

Use a VTVM, Ballantine 320 or equivalent, to measure rms ripple voltage of the power supply DC output. Use oscilloscope to measure peak-to-peak ripple voltage of the power supply DC output.

SERVICE

When additional instructions are required or repair service is desired, contact the nearest office of the Lambda Electronics Corp. where trained personnel and complete facilities are ready to assist you.

Please include the power supply model and serial number together with complete details of the problem. On receipt on this information, Lambda will supply service data or advise shipping for factory repair service.

All repairs not covered by the warranty will be billed at cost and an estimate forwarded for approval before work is started.

PARTS ORDERING

Standard components and special components used in the Lambda power supply can be obtained from the factory. In case of emergency, critical spare parts are available through any Lambda office.

The following information must be included when ordering parts:

1. Model number and serial number of power supply and purchase date.

2. Lambda part number.

3. Description of part together with circuit designation.

4. If part is not an electronic part, or is not listed, provide a description, function, and location, of the part.

PARTS LIST

The electrical parts located on Lambda models LQS-DA-5106 — LQS-DA-5348 are listed here. Parts common to a group of models are listed first. Unique parts of individual models within the group are listed separately, by model, immediately following the group common-parts listing.

PARTS FOR MODEL LQS-DA-5106

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C1	Cap., paper, 4 mf ±6%, 660 vac	CAN-40-032	$ 5.70
C2	Not assigned		
C3, C4	Cap., elect., 97,000 mf -10+100%, 7.5 vdc	CBT-97-029	11.67
CR1, CR2	Rectifier	FBL-00-083	3.57
T1	Transformer	ABA-QS51-06	109.29

COMMON PARTS
MODELS LQS-DA-5124 — LQS-DA-5148

C1	Cap., paper, 2.5 mf ±6%, 660 vac	CAN-25-029	4.65
C2, C4	Not assigned		
CR1, CR2	Rectifier	FBL-00-054	1.50

UNIQUE PARTS
MODEL LQS-DA-5124

C3	Cap., elect., 17,000 mf -10+100%, 50 vdc	CBT-17-022	12.39
S1	Part of T1		
T1	Transformer	ABA-QS51-24	109.29

MODEL LQS-DA-5128

C3	Cap., elect., 17,000 mf -10+100%, 50 vdc	CBT-17-022	12.39
S1	Part of T1		
T1	Transformer	ABA-QS51-28	109.29

MODEL LQS-DA-5148

C3	Cap., elect., 7,800 mf -10+100%, 60 vdc	CBS-78-045	9.00
T1	Transformer	ABA-QS51-48	109.29

COMMON PARTS
MODELS LQS-DA-5324 — LQS-DA-5348

C1, C2	Cap., paper, 2.5 mf ±6%, 660 vac	CAN-25-029	4.65
C3	Cap., elect., 17,000 mf -10+100%, 50 vdc	CBT-17-022	12.39
CR1, CR2	Rectifier	FBL-00-054	1.50

UNIQUE PARTS
MODEL LQS-DA-5324

C4	Cap., elect., 17,000 mf -10+100%, 50 vdc	CBT-17-022	12.39
T1	Transformer	ABA-QS53-24	109.29

UNIQUE PARTS (Cont.)
MODEL LQS-DA-5328

CIRC. DESIG.	DESCRIPTION	LAMBDA NO.	UNIT PRICE
C4	Cap., elect., 17,000 mf -10+100%, 50 vdc	CBT-17-022	$12.39
S1	Part of T1		
T1	Transformer	ABA-QS53-28	109.29

MODEL LQS-DA-5348

T1	Transformer	ABA-QS53-48	109.29

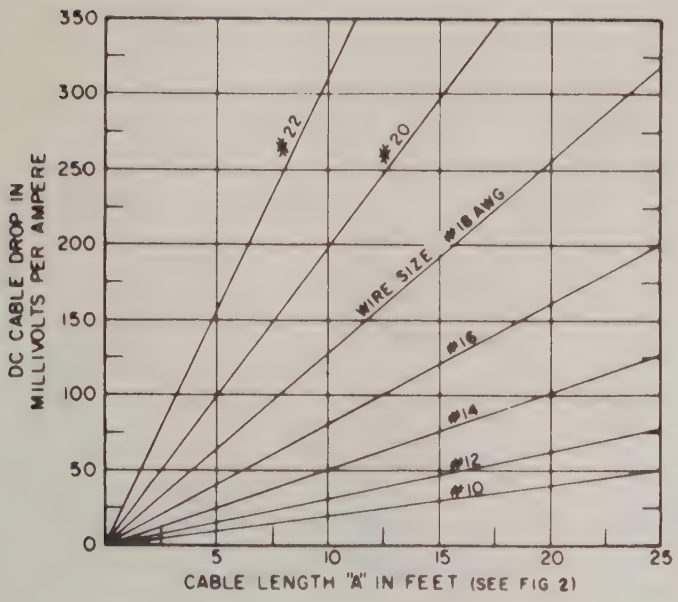


Figure 1. Cable Connection Chart

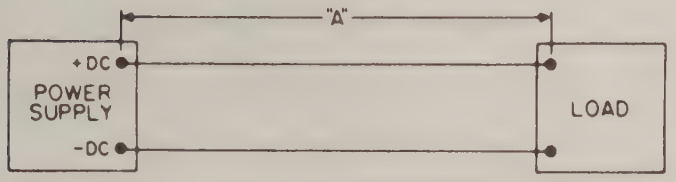
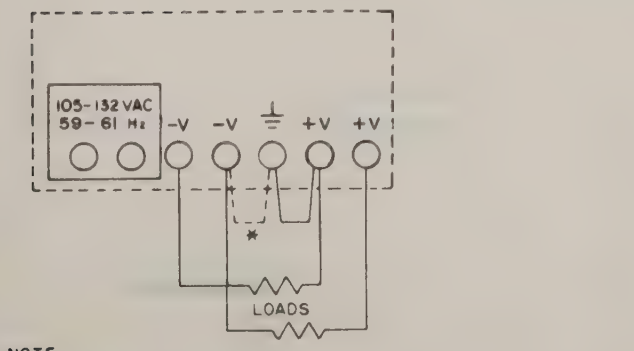


Figure 2. Cable Length "A" in Feet



NOTE
* FOR NEGATIVE GROUND, DISCONNECT JUMPER FROM TERMINALS ⏚ AND +V AND RECONNECT TO TERMINALS -V AND ⏚

Figure 3. Supply Load Connection

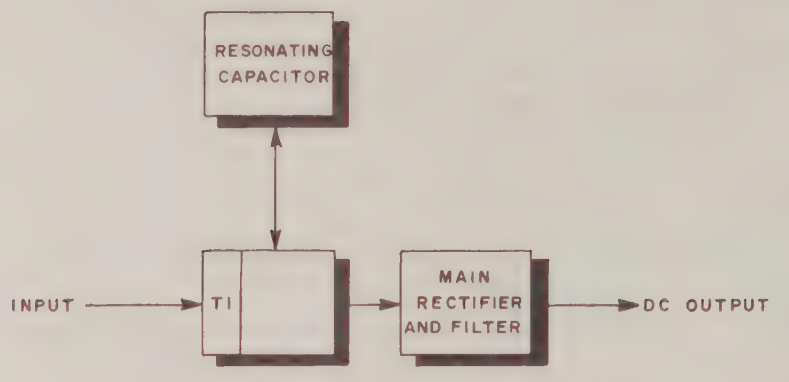


Figure 4. Typical Block Diagram

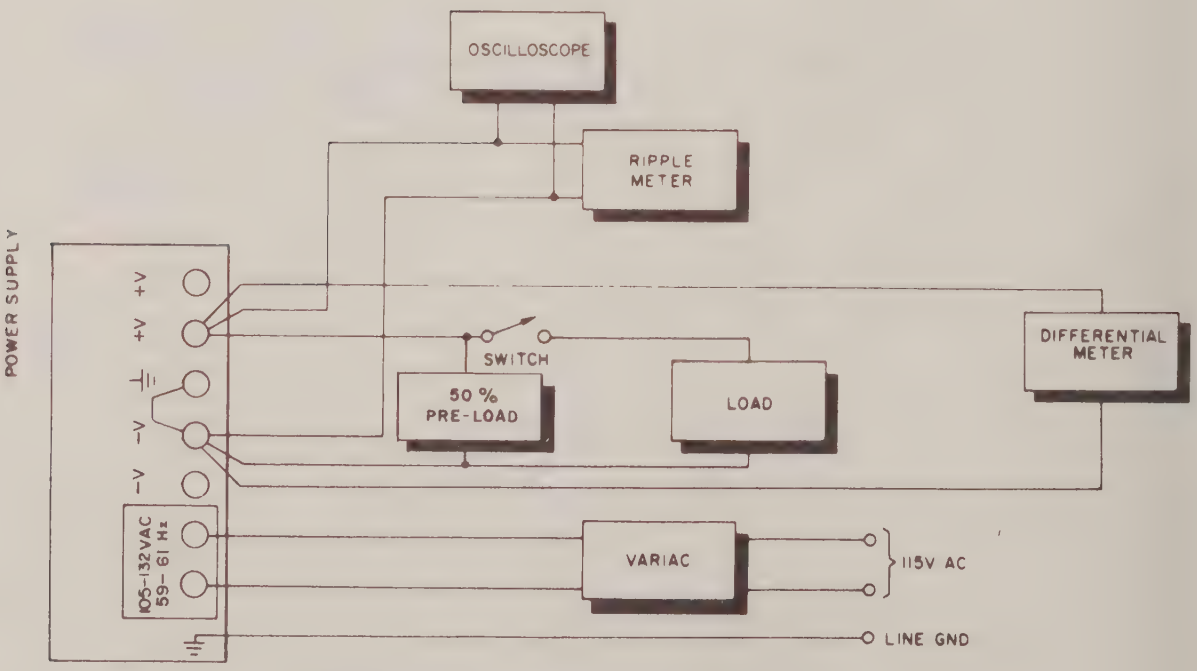
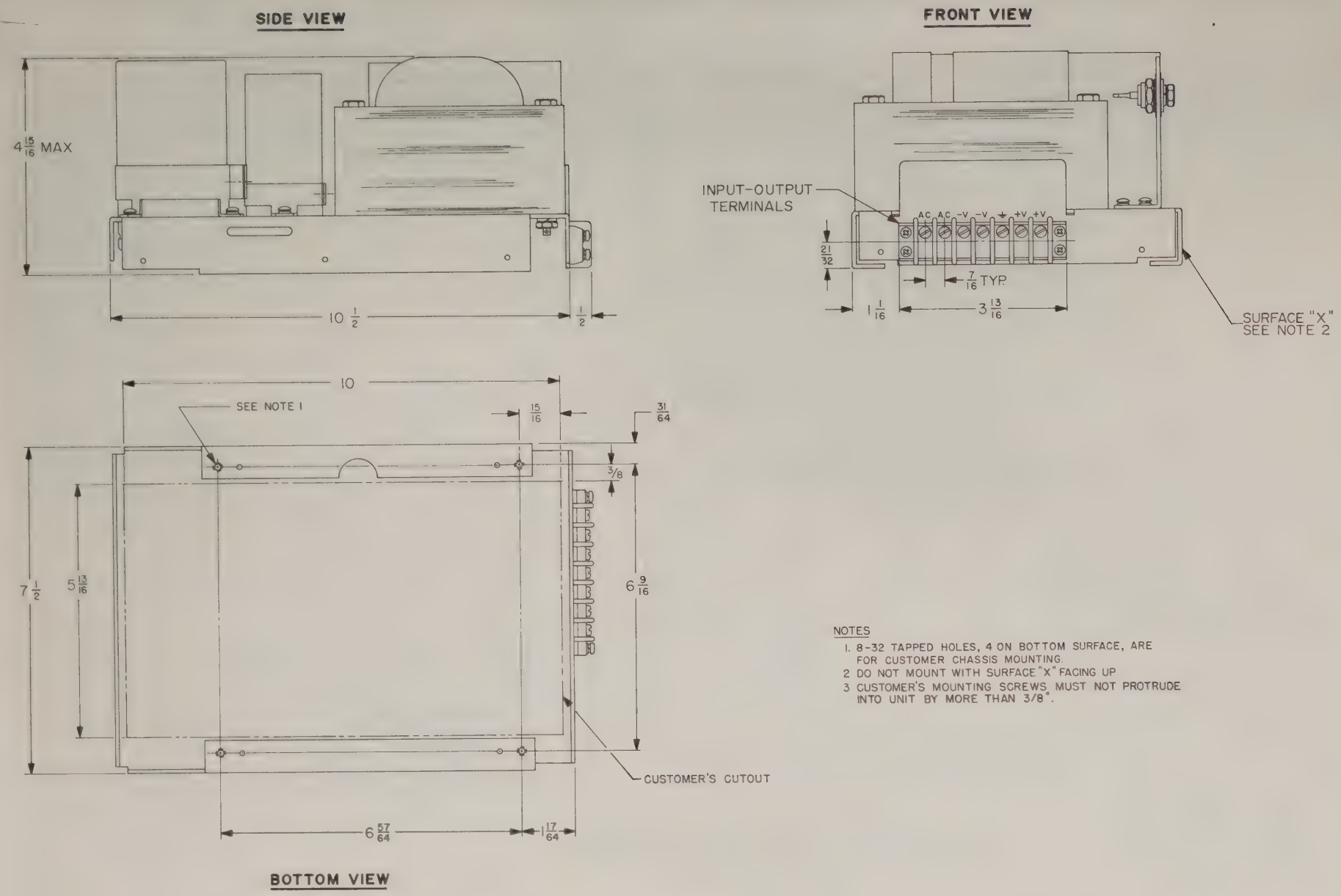


Figure 5. Test Connections For Constant Voltage Performance Checks



NOTES

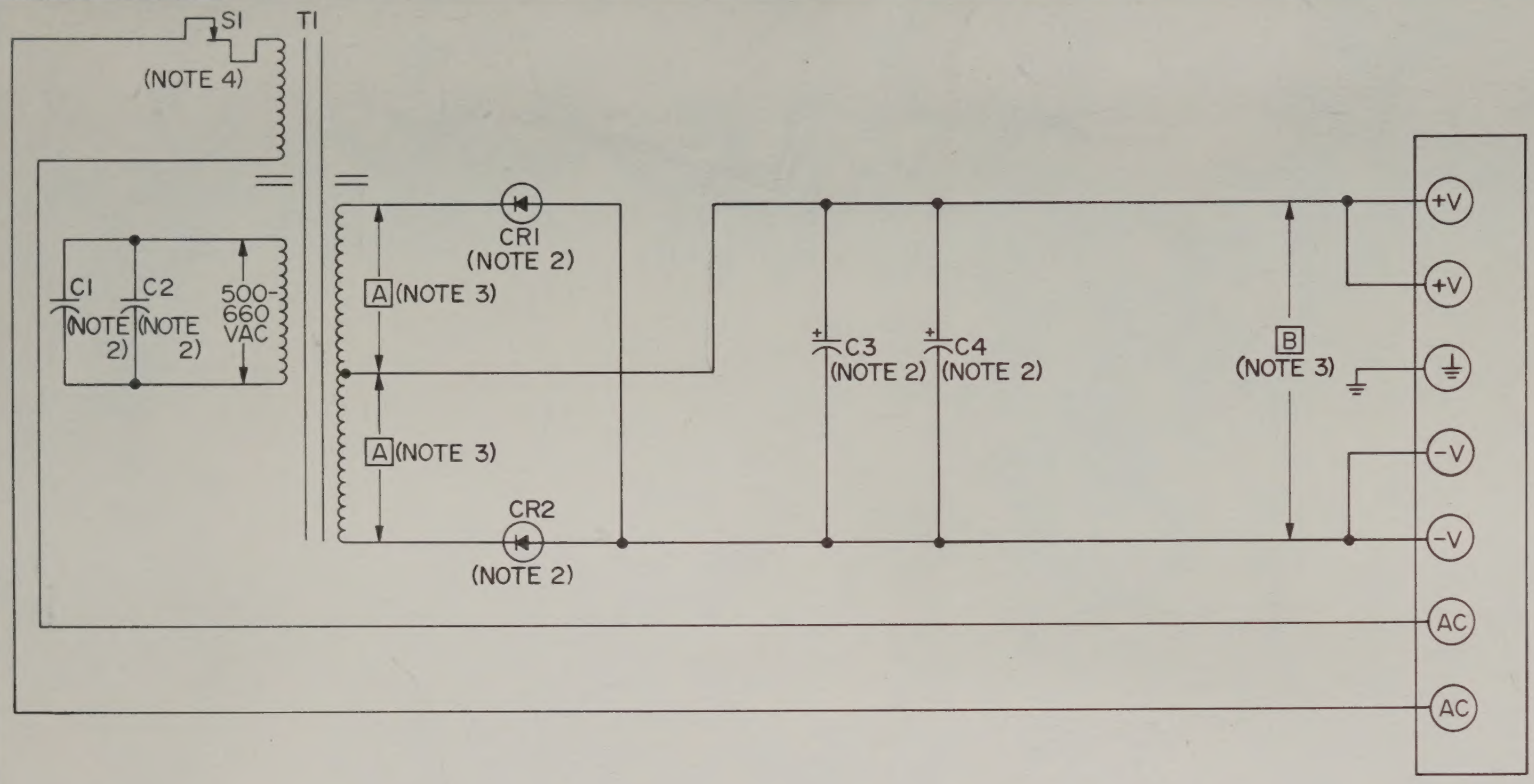
1. 8-32 TAPPED HOLES, 4 ON BOTTOM SURFACE, ARE FOR CUSTOMER CHASSIS MOUNTING.
2. DO NOT MOUNT WITH SURFACE "X" FACING UP
3. CUSTOMER'S MOUNTING SCREWS MUST NOT PROTRUDE INTO UNIT BY MORE THAN 3/8".

Figure 6. Outline Drawing

TABLE I
DATA REFERENCES FOR
MODELS LQS-DA-5000 SERIES

Models	Schematic Voltage Measurements		Schematic Components				
			C1	C2	C3	C4	CR1, CR2
	A (Vac)	B (Vdc)	±6% 660Vac Paper	±6% 660Vac Paper	-10+100% Elect	-10+100% Elect	*FBL-00-
LQS-DA-5106	6	6	4.0mf	Not used	97,000mf 7.5v	97,000mf 7.5v	083
LQS-DA-5124	24	24	2.5mf	Not used	17,000mf 50v	Not used	054
LQS-DA-5128	28	28	2.5mf	Not used	17,000mf 50v	Not used	054
LQS-DA-5148	48	48	2.5mf	Not used	7,800mf 60v	Not used	054
LQS-DA-5324	24	24	2.5mf	2.5mf	17,000mf 50v	17,000mf 50v	054
LQS-DA-5328	28	28	2.5mf	2.5mf	17,000mf 50v	17,000mf 50v	054
LQS-DA-5348	48	48	2.5mf	2.5mf	17,000mf 50v	Not used	054

* Lambda part number



MODELS
LQS-DA-5000 SERIES

NOTES:

1. CONDITIONS FOR CIRCUIT POINT MEASUREMENTS: INPUT: 115 VAC, 60 Hz, 1/2 LOAD. INDICATED VOLTAGES ARE TYPICAL VALUES. DC MEASUREMENT TAKEN WITH 20,000 OHMS/V VOLTMETER.
2. SEE TABLE I FOR COMPONENT VALUES.
3. SEE TABLE I FOR VOLTAGE VALUES.
4. THIS PART ONLY USED ON MODELS LQS-DA-5124, -5128 AND -5328.

THIS SCHEMATIC APPLIES TO UNITS BEARING SERIAL NO. PREFIX A.

FOR WIRING OF POWER SUPPLY TO LOAD REFER TO SUPPLY-TO-LOAD WIRING DIAGRAM.

LAMBDA
ELECTRONICS CORP.
MELVILLE, NEW YORK
A Veeco SUBSIDIARY

5-Year
Guarantee
We warrant each instrument manufactured by us, and sold by us or our authorized agents, to be free from defects in material and workmanship, and that it will perform within applicable specifications for a period of five years after original shipment. Our obligation under this guarantee is limited to repairing or replacing any instrument or part thereof, (except tubes and fuses) which shall, within five years after delivery to the original purchaser, be returned to us with transportation charges prepaid, prove after our examination to be thus defective.
We reserve the right to discontinue instruments without notice, and to make modifications in design at any time without incurring any obligation to make such modifications to instruments previously sold.

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